REMARKS -- TABLE OF CONTENTS

I. STATUS OF CLAIMS

Claims 1-29 were pending for examination at the time of the office action.

Claims 4, 6, 10 and 11 are objected to for having unclear claim language. See Examiner's Office action, p. 12 (27 May 2008).

Claims 13-24 stand rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. See Examiner's Office action, p. 12 (27 May 2008).

Claims 13-24 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. See Examiner's Office action, p. 14 (27 May 2008).

Claims 25 and 28 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. See Examiner's Office action, p. 15 (27 May 2008).

Claims 1, 3-10 13 and 15-22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mulgund et al. (US Publication No. 2002/0161751) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al (hereinafter Madden Ref.1). See Examiner's Office action, p. 16 (27 May 2008).

Claims 2 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mulgund et al. (2002/01611651) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al (hereinafter Madden Ref.1) and in further view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al (hereinafter Madden Ref.2). See Examiner's Office action, p. 18 (27 May 2008).

Claims 11, 12, 23 and 24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mulgund et al. (US Publication No. 2002/01611651) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al (Madden Ref.1) and in further view of Regli et al (U.S. Pub. No. 2005/0141706). See Examiner's Office action, p. 19 (27 May 2008).

Claims 25, 26 and 29 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mulgund et al. (US Publication No. 2002/01611651) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al (Madden Ref.1) and in further view of "A Transmission Control Scheme for Media Access in Sensor Networks" by Alec Woo et al. See Examiner's Office action, p. 20 (27 May 2008).

Claims 27 and 28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mulgund et al. (US Publication No. 2002/01611651) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al (Madden Ref.1) in further view of "A Transmission Control Scheme for Media Access in Sensor Networks" by Alec Woo et. al. and in further in view of "The Design of an Acquisitional Query Processor For Sensor Networks" by Samuel Madden et al (hereinafter Madden Ref.2). See Examiner's Office action, p. 22 (27 May 2008).

Claims 1-29 remain pending for examination.

II. ISSUES TO BE REVIEWED

The issues in this response relate to whether the art of record establishes a *prima facie* case of anticipation of Applicant's Claims 1-29, and whether the art of record establishes a *prima facie* case of unpatentability of Applicant's Claims 1-29. For reasons set forth elsewhere herein, Applicant respectfully asserts that the art of record does not establish a *prima facie* case of anticipation or unpatentability of any pending claim. Accordingly, Applicant respectfully requests that Examiner hold all pending Claims 1-29 allowable for at least the reasons described herein, and issue a Notice of Allowance on same.

III. ARGUMENT: ART OF RECORD DOES NOT ESTABLISH *PRIMA FACIE* CASE OF UNPATENTABILITY IN VIEW OF CITED ART OF RECORD

Applicant respectfully asserts herein that, under the MPEP and legal standards for patentability as set forth below, the art of record does not establish a *prima facie* case of the unpatentability of Applicant's claims at issue. Specifically, Applicant respectfully shows below that the art of record does not recite the text of Applicant's claims at issue,

and hence fails to establish a *prima facie* case of unpatentability. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections and hold all claims to be allowable over the art of record.

A. MPEP Standards for Patentability[1]

The MPEP states as follows: "the examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability. If that burden is met, the burden of coming forward with evidence or argument shifts to the applicant. . . If examination at the initial stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent." *MPEP* § 2107 (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992)); *In Re Glaug*, 283 F.3d 1335, 62 USPQ2d 1151 (Fed. Cir. 2002) ("During patent examination the PTO bears the initial burden of presenting a *prima facie* case of unpatentability. *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 252 U.S.P.Q. 785, 788 (Fed. Cir. 1984). If the PTO fails to meet this burden, then the applicant is entitled to the patent."). Accordingly, unless and until an examiner presents evidence establishing *prima facie* unpatentability, an applicant is entitled to a patent on all claims presented for examination.

1. MPEP Standards for Determining Anticipation

An examiner bears the initial burden of factually supporting any *prima facie* conclusion of anticipation. *Ex Parte Skinner*, 2 U.S.P.Q.2d 1788, 1788-89 (B.P.A.I. 1986); *In Re King*, 801 F.2d 1324, 521 U.S.P.Q. (BNA) 136 (Fed. Cir. 1986); *MPEP* § 2107 (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992) ("[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability....")). Failure of an examiner to meet this burden entitles an applicant to a patent. *Id.* ("[i]f examination at the initial

[1] Applicant is aware that Examiner is familiar with the MPEP standards. Applicant is merely setting forth the MPEP standards to serve as a framework for Applicant's arguments following and to ensure a complete written record is established. Should Examiner disagree with Applicant's characterization of the MPEP standards, Applicant respectfully requests correction.

stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent").

The MPEP indicates that in order for an examiner to establish a *prima facie* case of anticipation of an applicant's claim, the examiner must first interpret the claim,[2] and thereafter show that the cited prior art discloses the same elements, in the same arrangement, as the elements of the claim which the examiner asserts is anticipated. More specifically, the MPEP states that "[a] claim is anticipated *only if each and every element as set forth in the claim is found*, either expressly or inherently described, in a single prior art reference. . . . The identical invention must be shown in as complete detail as is contained in the . . . claim. . . . The elements must be arranged as required by the claim . . . ." *MPEP* § 2131 (emphasis added). Consequently, under the guidelines of the MPEP set forth above, if there is *any* substantial difference between the prior art cited by an examiner and an applicant's claim which the examiner asserts is rendered anticipated by the prior art, the prior art does NOT establish a *prima facie* case of anticipation and, barring other rejections, the applicant is entitled to a patent on such claim.

2. MPEP Standards for Determining Obviousness

"[T]he examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness."[3] *MPEP* § 2142. The MPEP indicates that in order for an examiner to establish a *prima facie* case that an invention, as defined by a claim at issue, is obvious, the examiner must (1) interpret the claim at issue; (2) define one or more prior art reference components relevant to the claim at issue; (3) ascertain the differences between the one or more prior art reference components and the elements of the claim at

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[2] With respect to interpreting a claim at issue, the MPEP directs that, during examination -- as opposed to subsequent to issue -- such claim be interpreted as broadly as the claim terms would reasonably allow, in light of the specification, when read by one skilled in the art with which the claimed invention is most closely connected. *MPEP* § 2111.

[3] An invention, as embodied in the claims, is rendered obvious if an examiner concludes that although the claimed invention is not identically disclosed or described in a reference, the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *MPEP* § 2141 (citing 35 U.S.C. § 103).

issue; and (4) adduce objective evidence which establishes, under a preponderance of the evidence standard, a teaching to modify the teachings of the prior art reference components such that the prior art reference components can be used to construct a device substantially equivalent to the claim at issue. This last step generally encompasses two sub-steps: (1) adducement of objective evidence teaching how to modify the prior art components to achieve the individual elements of the claim at issue; and (2) adducement of objective evidence teaching how to combine the modified individual components such that the claim at issue, as a whole, is achieved. *MPEP* § 2141; *MPEP* § 2143. Each of these forgoing elements is further defined within the MPEP. *Id.*

This requirement has been explained recently by the Supreme Court in *KSR v. Teleflex, 550 U.S. _____; 127 S. Ct. 1727 (2007)* which noted that such a rejection requires "some articulated reasoning ... to support the legal conclusion of obviousness." As stated by the Court, obviousness can be established where "there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, ***this analysis should be made explicit***." (*emphasis added*) See In re Kahn, 441 F. 3d 977, 988 (CA Fed. 2006) ('[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.')." *KSR v. Teleflex, 550 U.S. _____; 127 S. Ct. 1727 at 1741.*

As further described by the Court ***"[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.*** Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *KSR v. Teleflex, 550 U.S. _____; 127 S. Ct. 1727 at 1741.*

a) Interpreting a Claim at Issue

With respect to interpreting a claim at issue, the MPEP directs that, during examination -- as opposed to subsequent to issue -- such claim be interpreted as broadly as the claim terms would reasonably allow when read by one skilled in the art with which the claimed invention is most closely connected. In practice, this is achieved by giving each of the terms in the claim the "plain meaning" of the terms as such would be understood by those having ordinary skill in the art, and if portions of the claim have no "plain meaning" within the art, or are ambiguous as used in a claim, then the examiner is to consult the specification for clarification. *MPEP* § 2111.

b) Definition of One or More Prior Art Reference Components Relevant to the Claim at Issue

Once the claim at issue has been properly interpreted, the next step is the definition of one or more prior art reference components (*e.g.*, electrical, mechanical, or other components set forth in a prior art reference) relevant to the properly interpreted claim at issue. With respect to the definition of one or more prior art reference components relevant to the claim at issue, the MPEP defines three proper sources of such prior art reference components, with the further requirement that each such source must have been extant at the time of invention to be considered relevant. These three sources are as follows: patents as defined by 35 U.S.C. §102, printed publications as defined by 35 U.S.C. §102, and information (*e.g.*, scientific principles) deemed to be "well known in the art"[4] as defined under 35 U.S.C. §102. *MPEP* § 2141; *MPEP* § 2144.

[4] The fact that information deemed to be "well known in the art" can serve as a proper source of prior art reference components seems to open the door to subjectivity, but such is not the case. As a remedy to this potential problem, *MPEP* § 2144.03 states that if an examiner asserts that his position is derived from and/or is supported by a teaching or suggestion that is alleged to have been "well known in the art," and that if an applicant traverses such an assertion (that something was "well known within the art"), the examiner must cite a reference in support of his or her position. The same MPEP section also states that when a rejection is based on facts within the personal knowledge of an examiner, the data should be stated as specifically as possible, and the facts must be supported, when called for by the applicant, by an affidavit from the examiner. Such an affidavit is subject to contradiction or explanation by the affidavits of the applicant and other persons. *Id.* Thus, all sources of prior art reference components must be objectively verifiable.

c) Ascertainment of Differences between Prior Art Reference Components and Claim at Issue; Teaching to Modify and/or Combine Prior Art Reference Components to Remedy Those Differences in Order to Achieve Recitations of Claim at Issue

With one or more prior art components so defined and drawn from the proper prior art sources, the differences between the one or more prior art reference components and the elements of the claim at issue are to be ascertained. Thereafter, in order to establish a case of *prima facie* obviousness, an examiner must set forth a rationale, supported by objective evidence[5] sufficient to demonstrate under a preponderance of the evidence standard, that in the prior art extant at the time of invention there was a teaching to modify and/or combine the one or more prior art reference components to construct a device practicably equivalent to the claim at issue.

The preferable evidence relied upon is an express teaching to modify/combine within the properly defined objectively verifiable sources of prior art. In the absence of such express teaching, an examiner may attempt to establish a rationale to support a finding of such teaching reasoned from, or based upon, express teachings taken from the defined proper sources of such evidence (*i.e.*, properly defined objectively verifiable sources of prior art). *MPEP* § 2144; *In re Dembiczak*, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999).

The MPEP recognizes the pitfalls associated with the tendency to subconsciously use impermissible "hindsight" when an examiner attempts to establish such a rationale. The MPEP has set forth at least two rules to ensure against the likelihood of such impermissible use of hindsight. The first rule is that:

> under 35 U.S.C. 103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information,[6] the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at

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[5] The proper sources of the objective evidence supporting the rationale are the defined proper sources of prior art reference components, discussed above, with the addition of factually similar legal precedent. *MPEP* § 2144.

[6] "Factual information" is information actually existing or occurring, as distinguished from mere supposition or opinion. *Black's Law Dictionary* 532 (5th ed. 1979).

> that time to that person. Knowledge of an Applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search, and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon an Applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

MPEP § 2142 (emphasis added). Thus, if the only objective evidence of such teaching to modify and/or combine prior art reference components is an applicant's disclosure, no evidence of such teaching exists.[7]

The second rule is that if an examiner attempts to rely on some advantage or expected beneficial result that would have been produced by a modification and/or combination of the prior art reference components as evidence to support a rationale to establish such teachings to modify and/or combine prior art reference components, the MPEP requires that such advantage or expected beneficial result be objectively verifiable teachings present in the acceptable sources of prior art (or drawn from a convincing line of reasoning based on objectively verifiable established scientific principles or teachings). *MPEP* § 2144. Thus, as a guide to avoid the use of impermissible hindsight, these rules from the MPEP make clear that absent some objective evidence, sufficient to persuade under a preponderance of the evidence standard, no teaching of such modification and/or combination exists.[8]

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[7] An applicant may argue that an examiner's conclusion of obviousness is based on improper hindsight reasoning. However, "[a]ny judgment on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper." *MPEP* § 2145(X)(A) (emphasis added).

[8] *In Re Sang Su Lee* 277 F.3d 1338 (Fed. Cir. 2002) ("When patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness.") *See, e.g., McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52, 60 U.S.P.Q.2d 1001, 1008 (Fed. Cir. 2001) ("the central question is whether there is reason to combine [the] references," a question of fact drawing on the *Graham* factors). *"The factual inquiry whether to combine references must be thorough and searching." Id. It must be based on objective evidence of record. This precedent has been reinforced in myriad decisions, and cannot be dispensed with. See, e.g., Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1124-25, 56 U.S.P.Q.2d 1456, 1459 (Fed. Cir. 2000) ("a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential component of an obviousness holding'") (quoting *C.R. Bard, Inc., v. M3 Systems, Inc.*, 157 F.3d 1340, 1352, 48 U.S.P.Q.2d 1225, 1522 (Fed. Cir. 1998)); *In re Dembiczak*, 175 F.3d 994, 999,

B. Technical Material Cited by Examiner Mulgund ("U.S. Publication No. 2002/016751") and Madden ("TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks") Do Not Show or Suggest the Text of Amended Independent Claim 1 as Presented Herein; Notice of Allowance of Same Respectfully Requested

1. Amended Independent Claim 1

Amended Independent Claim 1 recites:

> 1. A method comprising:
> *transmitting with a second mote* at least a part of an *aggregate* of one or more mote-addressed content indexes *of a first set of motes*, wherein in the first set of motes excludes the second mote. (emphasis added)

As shown in the following, the technical material cited by the Examiner does not show or suggest the text of Independent Claim 1. Accordingly, Applicant respectfully requests that Examiner allow Independent Claim 1.

a) Technical Material Cited by Examiner Does Not Show or Suggest the Text of at Least Amended Independent Claim 1.

As set forth above, Independent Claim 1 recites:

> 1. A method comprising:
> [a] *transmitting with a second mote* at least a part of an *aggregate of* one or more mote-addressed *content indexes of a first*

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50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."); *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant); *In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988) ("'teachings of references can be combined only if there is some suggestion or incentive to do so.'") (emphasis in original) (quoting *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984)). The need for specificity pervades this authority. *See, e.g., In re Kotzab*, 217 F.3d 1365, 1371, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed"); *In re Rouffet*, 149 F.3d 1350, 1359, 47 U.S.P.Q.2d 1453, 1457-58 (Fed. Cir. 1998) ("even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill, that suggests the claimed combination. In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.")).

set of motes, wherein in the first set of motes excludes the second mote.[9] (Emphases added.)

With respect to Claim 1, Examiner has stated,

"As to claim 1, Mulgund shows

transmitting at least a part of one or more mote-addressed content indexes of a first set of motes [visiting a node and retrieving the information stored at the node] (paragraphs [0025] and [0062]), wherein the terms "node" and "mote" are interpreted to have the same meaning of small embedded platform that has one or more sensors (paragraph [0026]) and therefore these terms are used here interchangeably.

Mulgund does not explicitly show that at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes is transmitted. Madden shows transmitting at least a part of an aggregate of one or more mote addressed content indexes of a first set of motes [a collection phase, where the aggregate value are continually routed up from children to parents] (abstract, section 1.1 paragraph 2, section 4 and 4.1 paragraphs 1-2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Mulgund by transmitting at least a part of an aggregate of one of more mote-addressed content indexes in order to lower the number of message transmissions, latency, and power consumption than the sewer-based approach (as taught by Mulgund) (Madden, section 4 under In-Network Aggregates)."

See Examiner's *Office Action*, p. 16-17 (May 27, 2008).

(1) Examiner Citations With Regard to Clause [a] of Independent Claim 1

Applicant respectfully points out that Applicant has reviewed the portions of Mulgund and Madden Ref.1 identified by Examiner, and so far as Applicant can discern, Mulgund and Madden Ref.1do not recite the text of clause [a] of Applicant's Independent Claim 1. Rather, the portions of Mulgund and Madden Ref.1 cited by Examiner recite as follows:

[0025] It is of no concern how this network topology came into being, how it is organized, what routing algorithms are used to pass messages from one node to the next, but rather, how to aggregate the information at

[9] The lettering of the clauses herein is merely for sake of clarity of argument and should not be taken to imply any particular ordering of the clauses.

each of the nodes into an off-network repository or network model database 12. The sensing nodes 2 may be mobile, and the interconnections may change over time. Furthermore, new nodes may join the network 4 at any time, and existing nodes may leave the network unexpectedly.

[0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.

[0062] The traversal process begins at node A 32. Node A 32 is visited and pushed onto the stack. The process of visiting a node involves retrieving the information stored at the node, and updating the local database.

See *Mulgund* (paragraphs 0025, 0026 and 0062)

We present the Tiny AGgregation (TAG) service for aggregation in TinyOS. TAG allows users to express simple, declarative queries and have them distributed and executed efficiently in networks of low-power, wireless sensors. We discuss various generic properties of aggregates, and show how those properties affect the performance of our in-network approach. We include a performance study demonstrating the advantages of our approach over traditional centralized, out-of network methods, and discuss a variety of optimizations for improving the performance and fault-tolerance of the basic solution.

TAG operates as follows: users pose aggregation queries from a powered, storage-rich base station. Operators that implement the query are distributed into the network by piggybacking on the existing ad hoc networking protocol. Sensors route data back towards the user through a routing tree rooted at the base station. As data flows up this tree, it is aggregated according to an aggregation function and value-based partitioning specified in the query. For example, consider the problem of counting the number of nodes in a network of indeterminate size. First, the request to count is injected into the network. Then, each leaf node in the tree reports a count of 1 to their parent; interior nodes sum the count of

their children, add 1 to it, and report that value to their parent. Counts propagate up the tree in this manner, and flow out at the root.

Given the simple routing protocol from Section 2.1 and our SQL-like query model, we now discuss the implementation of the core TAG algorithm for in-network aggregation.

A naive implementation of sensor network aggregation would be to use a centralized, server-based approach where all sensor readings are sent to the base station, which then computes the aggregates. In TAG, however, we compute aggregates in-network whenever possible, because, if properly implemented, this approach can be lower in number of message transmissions, latency, and power consumption than the server-based approach. We will measure the advantage of in-network aggregation in Section 5 below; first, we present the basic algorithm in detail. We first consider the operation of the basic approach in the absence of grouping; we show how to extend it with grouping in Section 4.2.

TAG consists of two phases: a distribution phase, in which aggregate queries are pushed down into the network, and a collection phase, where the aggregate values are continually routed up from children to parents. Recall that our query semantics partition time into epochs of duration i, and that we must produce a single aggregate value (when not grouping) that combines the readings of all sensors in the network during that epoch.

Given our goal of using as few messages as possible, the collection phase must insure that parents in the routing tree wait until they have heard from their children before propagating an aggregate value for the current epoch. We will accomplish this by having parents subdivide the epoch such that children are required to deliver their partial state records during a parent-specified time interval. This interval is selected such that there is enough time for the parent to combine partial state records and propagate its own record to its parent.

See *Madden Ref.1* (Abstract, section 1.1, paragraph 2, section 4, and section 4.1, paragraphs 1 and 2).

As can be seen from the foregoing, the Examiner-identified portions of Mulgund and Madden Ref.1 do *not recite* the text of clause [a] as recited in Independent Claim 1. For example, Mulgund teaches "The process of visiting a node involves retrieving the information stored at the node, and updating the local database." (Emphasis added) Madden Ref.1 teaches "where all sensor readings are sent to the base station, which then computes the aggregates. In TAG, however, we compute aggregates [of the sensor

readings] in-network." (Emphasis added) On the other hand, clause [a] recites "*transmitting with a second mote* at least a part of an aggregate of one or more mote-addressed *content indexes of a first set of motes*, wherein in the first set of motes excludes the second mote." (emphasis added). The cited text does not show or recite "*transmitting with a second mote … content indexes of a first set of motes.*"

Applicant has reviewed the Examiner-cited portions of Mulgund and Madden Ref.1 and is unable to locate a recitation of clause [a] of Claim 1. Applicant further respectfully points out that the Examiner has provided no objectively verifiable evidence, or argument based on objectively verifiable evidence, as to why the text of the reference passages should be interpreted to teach clause [a] of amended Independent Claim 1.

Given that Applicant has shown, above, what Mulgund and Madden Ref.1 actually recites, the question thus naturally arises as to how Examiner saw Mulgund and Madden Ref.1 as "teaching" something related to Clause [a] of Independent Claim 1. Applicant respectfully points out that the Applicant's Application is the only objectively verifiable examiner-cited document of record that shows or suggests what Examiner purports the reference to teach. From this and the express recitations of Mulgund and Madden Ref.1 as set forth, it follows that Examiner is interpreting Mulgund and Madden Ref.1 through the lens of Applicant's application, which is impermissible hindsight use. Thus, at present, Examiner's assertions regarding Mulgund and Madden Ref.1 are untenable. Under the MPEP guidelines as set forth above, the cited art of record fails to establish a prima facie case of unpatentability for at least these reasons. Accordingly, for at least the foregoing reasons, Applicant respectfully requests that Examiner hold Independent Claim 1 allowable and issue a Notice of Allowability of same.

In the alternative and/or in addition to the foregoing, as Examiner has provided no objectively verifiable evidence, nor argument based on objectively verifiable evidence, in support of Examiner assertions regarding what the technical material cited by Examiner "teaches," Applicant infers that the Examiner is relying on "personal knowledge" and/or is taking "official notice" of one or more factors to reach the factual conclusion of what the cited technical material "teaches." In view of the foregoing, if Examiner desires to maintain the rejection, in the next communication, Applicant respectfully requests that the Examiner provide an affidavit or declaration setting forth objectively verifiable

evidence in support of Examiner's currently unsupported assertions regarding what the cited technical material "teaches" and/or should be interpreted to "teach." *See, e.g.*, MPEP §2144.03(C), *If Applicant Challenges a Factual Assertion as Not Properly Officially Notices or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding with Adequate Evidence*, and 37 C.F.R. 1.104(d)(2).

In view of the foregoing, and under the MPEP standards as set forth above, Applicant respectfully submits that the Examiner-cited art does not establish a *prima facie* case of unpatentability of Independent Claim 1. Accordingly, for at least the foregoing reasons, Applicant respectfully asks Examiner to hold Independent Claim 1 allowable and to issue a Notice of Allowance of same.

2. Dependent Claims 2-12: Patentable for at Least Reasons of Dependency from Independent Claim 1.

Claims 2-12 depend either directly or indirectly from Independent Claim 1. "A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers." *See* 35 U.S.C. §112 paragraph 4. Consequently, Dependent Claims 2-12 are patentable for at least the reasons why Independent Claim 1 is patentable. Accordingly, Applicant respectfully requests that Examiner hold Dependent Claims 2-12 patentable for at least the foregoing reasons, and issue a Notice of Allowance on same.

3. Dependent Claims 5 Independently Patentable

Notwithstanding its dependency from Independent Claim 1, Dependent Claim 5 is patentable on its own merits.

Claim 5 was rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al. Applicant respectfully traverses the rejection of claim 5.

Amended Claim 1 recites:

1. A method comprising:

transmitting with a second mote at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, wherein in the first set of motes excludes the second mote.

Claim 5 is dependent on claim 1. Amended claim 5 recites:

> 5. The method of Claim 1, wherein said transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes further comprises:
>
> obtaining access to the one or more mote-addressed content indexes of the first set of motes, wherein the mote-addressed content indexes of the first set of motes comprises memory addresses of content stored in a memory in the first set of motes.

The Office action at page 6, paragraph 12, recites:

"Claims 1, 3-10, 13, and 15-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulgund et al. (200210161751) in view of "TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks" by Samuel Madden et al."

More specifically, the Office action, at page 17, recites:

> As to claim 5, Mulgund in view of Madden shows obtaining access to the one or more mote-addressed content indexes of the first set of motes [parent node obtaining a message from a child node, message containing one or more mote addressed content indexes) (section 2. 1, last paragraph, Madden).
>
> And Madden at section 2.1, last paragraph recites
>
> :
>
> When a sensor wishes to send a message to the root, it broadcasts a message addressed to its parent, which in turn forwards the message on to its parent, and so on, eventually reaching the root. In the Section 4, we show how, as data is routed towards the root, it can be combined with data from other sensors to efficiently combine routing and aggregation. Now, however, we turn to the syntax and semantics of aggregate queries in TAG.

As can be seen from the foregoing, the Examiner-identified portions of Mulgund and Madden Ref.1 do *not recite* the text as recited in amended dependent Claim 5. For

example, Mulgund teaches "The process of visiting a node involves retrieving the information stored at the node, and updating the local database." (Emphasis added) Madden Ref.1 teaches "When a sensor wishes to send a message to the root, it broadcasts a message addressed to its parent, which in turn forwards the message on to its parent, and so on, eventually reaching the root." (Emphasis added) On the other hand, claim 5 recites "obtaining access to the one or more mote-addressed content indexes of the first set of motes, wherein *the mote-addressed content indexes of the first set of motes comprises memory addresses of content stored in a memory in the first set of motes.*" (emphasis added). The cited text does not show or recite "*the mote-addressed content indexes of the first set of motes comprises memory addresses of content stored in a memory in the first set of motes.*"

Applicant has reviewed the Examiner-cited portions of Mulgund and Madden Ref.1 and is unable to locate a recitation or suggestion of the above-quoted recitations of Claim 5. Applicant respectfully points out that the Examiner has provided no objectively verifiable evidence, or argument based on objectively verifiable evidence, as to why the text of the reference passages should be interpreted to teach amended Independent Claim 5.

In addition, as noted above, after (1) interpreting the claim at issue and (2) defining one or more relevant prior art reference components, the Examiner should (3) ascertain the differences between the one or more prior art reference components and the elements of the claim at issue, and (4) adduce objective evidence which establishes a teaching to modify the teachings of the prior art reference components such that the prior art reference components can be used to construct a device substantially equivalent to the claim at issue. (see pages 14-18 *infra*; *MPEP* § 2141; *MPEP* § 2143). Applicant respectfully submits Examiner's unpatentability analysis fails to adequately satisfy the Examiner's burden with respect to portions (3) and (4) of said analysis.

Given that Applicant has shown, above, what Mulgund and Madden Ref.1 actually recites, the question thus naturally arises as to how Examiner saw Mulgund and Madden Ref.1 as "teaching" something related to Claim 5. Applicant respectfully points out that the Applicant's Application is the only objectively verifiable examiner-cited document of record that shows or suggests what Examiner purports the reference to

teach. From this and the express recitations of Mulgund and Madden Ref.1 as set forth, it follows that Examiner is interpreting Mulgund and Madden Ref.1 through the lens of Applicant's application, which is impermissible hindsight use. Thus, at present, Examiner's assertions regarding Mulgund and Madden Ref.1 are untenable. Under the MPEP guidelines as set forth above, the cited art of record fails to establish a prima facie case of unpatentability for at least these reasons. Accordingly, for at least the foregoing reasons, Applicant respectfully requests that Examiner hold amended dependent Claim 5 allowable and issue a Notice of Allowability of same.

In the alternative and/or in addition to the foregoing, as Examiner has provided no objectively verifiable evidence, nor argument based on objectively verifiable evidence, in support of Examiner assertions regarding what the technical material cited by Examiner "teaches," Applicant infers that the Examiner is relying on "personal knowledge" and/or is taking "official notice" of one or more factors to reach the factual conclusion of what the cited technical material "teaches." In view of the foregoing, if Examiner desires to maintain the rejection, in the next communication, Applicant respectfully requests that the Examiner provide an affidavit or declaration setting forth objectively verifiable evidence in support of Examiner's currently unsupported assertions regarding what the cited technical material "teaches" and/or should be interpreted to "teach." *See, e.g.*, MPEP §2144.03(C), *If Applicant Challenges a Factual Assertion as Not Properly Officially Notices or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding with Adequate Evidence*, and 37 C.F.R. 1.104(d)(2).

In view of the foregoing, and under the MPEP standards as set forth above, Applicant respectfully submits that the Examiner-cited art does not establish a *prima facie* case of unpatentability of Independent Claim 5. Accordingly, for at least the foregoing reasons, Applicant respectfully asks Examiner to hold Independent Claim 5 allowable and to issue a Notice of Allowance of same.

C. Technical Material Cited by Examiner Mulgund ("U.S. Publication No. 2002/016751") and Madden ("TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks") Do Not Show or Suggest the Text of Amended Independent Claim 13 as Presented Herein; Notice of Allowance of Same Respectfully Requested

1. Amended Independent Claim 13

Amended Independent Claim 13 recites:

> 13. A system comprising:
> a transmitter controlled by a second mote to transmit at *least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes*, wherein the first set of motes excludes the second mote. (emphasis added)

As shown in the following, the technical material cited by the Examiner does not show or suggest the text of Independent Claim 13. Accordingly, Applicant respectfully requests that Examiner allow Independent Claim 13.

a) Technical Material Cited by Examiner Does Not Show or Suggest the Text of at Least Amended Independent Claim 13.

As set forth above, Independent Claim 13 recites:

> 13. A system comprising:
> [a] a transmitter controlled by a second mote to transmit at *least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes*, wherein the first set of motes excludes the second mote. (emphasis added)

With respect to Claim 13, Examiner has stated,

> "As to claims 13, and 15-22, Mulgund in view of Madden shows all the elements, as discussed above with respect to corresponding claim 1, and claims 3-10."

See Examiner's *Office Action*, p. 18 (May 27, 2008).

(1) Examiner Citations With Regard to Clause [a] of Independent Claim 13

Applicant respectfully points out that Applicant has reviewed the portions of Mulgund identified by Examiner, and so far as Applicant can discern, Mulgund does not recite the text of clause [a] of Applicant's Independent Claim 13. Rather, the portions of Mulgund cited by Examiner recites as follows:

> [0025] It is of no concern how this network topology came into being, how it is organized, what routing algorithms are used to pass messages from one node to the next, but rather, how to aggregate the information at each of the nodes into an off-network repository or network model database 12. The sensing nodes 2 may be mobile, and the interconnections may change over time. Furthermore, new nodes may join the network 4 at any time, and existing nodes may leave the network unexpectedly.
>
> [0026] FIG. 2 illustrates the nature of each of the sensing nodes 2, which comprise computational devices (possibly ranging in complexity from small embedded platforms to a fully-fledged PCs) that have one or more sensors 16 providing high-value information connected to it. The term sensor is used here in a general sense. A sensor 16 as contemplated herein could be as simple as an instrument that measures temperature, pressure, or any such other physical quantity. It could also be a device as complex as a video camera providing continuous full-motion imagery of some area of interest. In any case, the output of each of these sensors 16 is stored locally in a well-defined knowledge base 18, but the output can be accessed from outside the network 4 through some software application programming interface (API) and hardware implementation. Each of the sensing nodes 2 is additionally in communication with one or more other sensing nodes through connecting links 3.
>
> [0062] The traversal process begins at node A 32. Node A 32 is visited and pushed onto the stack. The process of visiting a node involves retrieving the information stored at the node, and updating the local database.

See *Mulgund* (paragraphs 0025, 0026 and 0062)

> We present the Tiny AGgregation (TAG) service for aggregation in TinyOS. TAG allows users to express simple, declarative queries and have them distributed and executed efficiently in networks of low-power, wireless sensors. We discuss various generic properties of aggregates, and show how those properties affect the performance of our in-network approach. We include a performance study demonstrating the advantages of our approach over traditional centralized, out-of network methods, and discuss a variety of optimizations for improving the performance and fault-tolerance of the basic solution.

TAG operates as follows: users pose aggregation queries from a powered, storage-rich base station. Operators that implement the query are distributed into the network by piggybacking on the existing ad hoc networking protocol. Sensors route data back towards the user through a routing tree rooted at the base station. As data flows up this tree, it is aggregated according to an aggregation function and value-based partitioning specified in the query. For example, consider the problem of counting the number of nodes in a network of indeterminate size. First, the request to count is injected into the network. Then, each leaf node in the tree reports a count of 1 to their parent; interior nodes sum the count of their children, add 1 to it, and report that value to their parent. Counts propagate up the tree in this manner, and flow out at the root.

Given the simple routing protocol from Section 2.1 and our SQL-like query model, we now discuss the implementation of the core TAG algorithm for in-network aggregation.

A naive implementation of sensor network aggregation would be to use a centralized, server-based approach where all sensor readings are sent to the base station, which then computes the aggregates. In TAG, however, we compute aggregates in-network whenever possible, because, if properly implemented, this approach can be lower in number of message transmissions, latency, and power consumption than the server-based approach. We will measure the advantage of in-network aggregation in Section 5 below; first, we present the basic algorithm in detail. We first consider the operation of the basic approach in the absence of grouping; we show how to extend it with grouping in Section 4.2.

TAG consists of two phases: a distribution phase, in which aggregate queries are pushed down into the network, and a collection phase, where the aggregate values are continually routed up from children to parents. Recall that our query semantics partition time into epochs of duration i, and that we must produce a single aggregate value (when not grouping) that combines the readings of all sensors in the network during that epoch.

Given our goal of using as few messages as possible, the collection phase must insure that parents in the routing tree wait until they have heard from their children before propagating an aggregate value for the current epoch. We will accomplish this by having parents subdivide the epoch such that children are required to deliver their partial state records during a parent-specified time interval. This interval is selected such that there is enough time for the parent to combine partial state records and propagate its own record to its parent.

See *Madden Ref.1* (Abstract, section 1.1, paragraph 2, section 4, and section 4.1, paragraphs 1 and 2).

As can be seen from the foregoing, the Examiner-identified portions of Mulgund and Madden Ref.1 do *not recite or fairly suggest* the text of clause [a] as recited in Independent Claim 13. For example, Mulgund teaches "The process of visiting a node involves retrieving the information stored at the node, and updating the local database." (Emphasis added) Madden Ref.1 teaches "where all sensor readings are sent to the base station, which then computes the aggregates. In TAG, however, we compute aggregates [of the sensor readings] in-network." (Emphasis added) On the other hand, clause [a] recites "a transmitter controlled by *a second mote to transmit at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes*, wherein the first set of motes excludes the second mote." (emphasis added). The cited text does not fairly show or recite "*second mote to transmit at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes.*"

Applicant has reviewed the Examiner-cited portions of Mulgund and Madden Ref.1 and is unable to locate a recitation or suggestion of clause [a] of Claim 13. Applicant further respectfully points out that the Examiner has provided no objectively verifiable evidence, or argument based on objectively verifiable evidence, as to why the text of the reference passages should be interpreted to teach clause [a] of amended Independent Claim 13.

In addition, as noted above, after (1) interpreting the claim at issue and (2) defining one or more relevant prior art reference components, the Examiner should (3) ascertain the differences between the one or more prior art reference components and the elements of the claim at issue, and (4) adduce objective evidence which establishes a teaching to modify the teachings of the prior art reference components such that the prior art reference components can be used to construct a device substantially equivalent to the claim at issue. (see pages 14-18 *infra*; *MPEP* § 2141; *MPEP* § 2143). Applicant respectfully submits Examiner's unpatentability analysis fails to adequately satisfy the Examiner's burden with respect to portions (3) and (4) of said analysis.

Given that Applicant has shown, above, what Mulgund and Madden Ref.1 actually recites, the question thus naturally arises as to how Examiner saw Mulgund and Madden Ref.1 as "teaching" something related to Clause [a] of Independent Claim 13.

Applicant respectfully points out that the Applicant's Application is the only objectively verifiable examiner-cited document of record that shows or suggests what Examiner purports the reference to teach. From this and the express recitations of Mulgund and Madden Ref.1 as set forth, it follows that Examiner is interpreting Mulgund and Madden Ref.1 through the lens of Applicant's application, which is impermissible hindsight use. Thus, at present, Examiner's assertions regarding Mulgund and Madden Ref.1 are untenable. Under the MPEP guidelines as set forth above, the cited art of record fails to establish a prima facie case of unpatentability for at least these reasons. Accordingly, for at least the foregoing reasons, Applicant respectfully requests that Examiner hold Independent Claim 13 allowable and issue a Notice of Allowability of same.

In the alternative and/or in addition to the foregoing, as Examiner has provided no objectively verifiable evidence, nor argument based on objectively verifiable evidence, in support of Examiner assertions regarding what the technical material cited by Examiner "teaches," Applicant infers that the Examiner is relying on "personal knowledge" and/or is taking "official notice" of one or more factors to reach the factual conclusion of what the cited technical material "teaches." In view of the foregoing, if Examiner desires to maintain the rejection, in the next communication, Applicant respectfully requests that the Examiner provide an affidavit or declaration setting forth objectively verifiable evidence in support of Examiner's currently unsupported assertions regarding what the cited technical material "teaches" and/or should be interpreted to "teach." *See, e.g.*, MPEP §2144.03(C), *If Applicant Challenges a Factual Assertion as Not Properly Officially Notices or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding with Adequate Evidence*, and 37 C.F.R. 1.104(d)(2).

In view of the foregoing, and under the MPEP standards as set forth above, Applicant respectfully submits that the Examiner-cited art does not establish a *prima facie* case of unpatentability of Independent Claim 13. Accordingly, for at least the foregoing reasons, Applicant respectfully asks Examiner to hold Independent Claim 13 allowable and to issue a Notice of Allowance of same.

2. Dependent Claims 14-24: Patentable for at Least Reasons of Dependency from Independent Claim 13.

Claims 14-24 depend either directly or indirectly from Independent Claim 13. "A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers." *See* 35 U.S.C. §112 paragraph 4. Consequently, Dependent Claims 14-24 are patentable for at least the reasons why Independent Claim 17 is patentable. Accordingly, Applicant respectfully requests that Examiner hold Dependent Claims 14-24 patentable for at least the foregoing reasons, and issue a Notice of Allowance on same.

D. Technical Material Cited by Examiner Mulgund et. al. ("U.S. Pub. No. 2002/0161751"), Madden et. al. ("TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks") and Woo et. al. ("A Transmission Control Scheme for media Access in Sensor Networks") Do Not Show or Suggest the Text of Amended Independent Claim 25 as Presented Herein; Notice of Allowance of Same Respectfully Requested

1. Amended Independent Claim 25

Amended Independent Claim 25 recites:

> 25. A system comprising:
> a second mote; and
> *means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, the first set of motes excluding the second mote*, and said means for transmitting being disposed proximate to said second mote. (emphasis added)

As shown in the following, the technical material cited by the Examiner does not show or suggest the text of Independent Claim 25. Accordingly, Applicant respectfully requests that Examiner allow Independent Claim 25.

a) Technical Material Cited by Examiner Does Not Show or Suggest the Text of at Least Amended Independent Claim 25.

As set forth above, Independent Claim 25 recites:
25. A system comprising:

a second mote; and

[a] *means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, the first set of motes excluding the second mote*, and said means for transmitting being disposed proximate to said second mote. (Emphases added)

With respect to Claim 25, Examiner has stated,

"As to claim 25, Mulgund shows a mote (Fig. 1 node (2)).

Mulgund does not explicitly show means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, said means for transmitting proximate to said mote.

Madden shows means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, said means for transmitting proximate to said mote [a TinyOS that facilitates routing data from child device to a parent device] (section 1 Introduction).

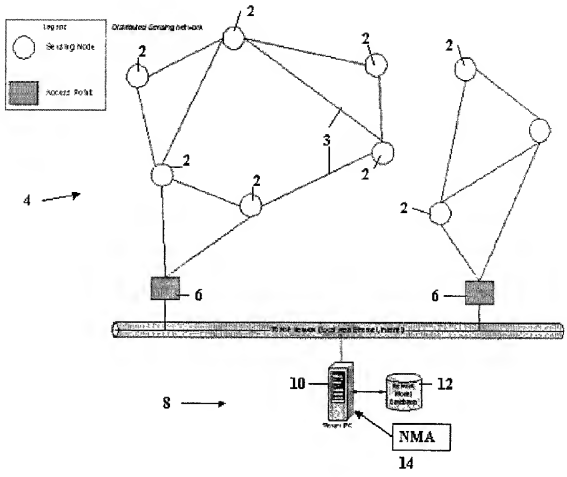
It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Mulgund by having means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, said means for transmitting proximate to said mote in order to facilitate routing data between devices (Madden, section 1).

In support to the teaching of Madden, Woo shows a complete TinyOS application component graph wherein the sensor component periodically transmits the data toward a base station over the multihop network (section 2.1 Networking Component Stack)."

See Examiner's *Office Action*, p. 21 (May 27, 2008).

(1) Examiner Citations With Regard to Clause [a] of Independent Claim 25

Applicant respectfully points out that Applicant has reviewed the portions of Mulgund, Madden and Woo identified by Examiner, and so far as Applicant can discern, Mulgund, Madden and Woo do not recite the text of clause [a] of Applicant's Independent Claim 25. Rather, the portions of Mulgund, Madden Ref.1 and Woo cited by Examiner recites as follows:



See *Mulgund* (Fig. 1)

In the past few years, smart sensor devices have matured to the point that it is now feasible to deploy large, distributed networks of such sensors [42, 23, 37, 81]. Sensor networks are differentiated from other wireless, battery-powered environments in that they consist of tens or hundreds of autonomous nodes that operate without human interaction (e.g. configuration of network routes, recharging of batteries, or tuning of parameters) for weeks or months at a time. Furthermore, sensor networks are often embedded into some (possibly remote) physical environment from which they must monitor and collect data. The long-term, low-power nature of sensor networks, coupled with their proximity to physical phenomena, lead to a significantly altered view of software systems than that of more traditional mobile or distributed environments. In this paper, we are concerned with query processing in sensor networks. Researchers have noted the benefits of a query processor-like interface to sensor networks and the need for sensitivity to limited power and computational resources [27,33,41,48,34]. Prior systems, however, tend to view query processing in sensor networks simply as a power-constrained version of traditional query processing: given some set of data, they strive to process that data as energy-efficiently as possible. Typical strategies include

minimizing expensive communication by applying aggregation and filtering operations inside the sensor network strategies that are familiar from push-down techniques from distributed query processing that emphasize moving queries to data.

In contrast, we present acquisitional query processing (ACQP), where we focus on the significant new query processing opportunity that arises in sensor networks: the fact that smart sensors have control over where, when, and how often data is physically acquired (i.e. sampled) and delivered to query processing operators. By focusing on the locations and costs of acquiring data, we are able to significantly reduce power consumption compared to traditional passive systems that assume the a priori existence of data. Acquisitional issues arise at all levels of query processing: in query optimization, due to the significant costs of sampling sensors; in query dissemination, due to the physical co-location of sampling and processing; and, most importantly, in query execution, where choices of when to sample and which samples to process are made. Of course, techniques proposed in other research on sensor and power-constrained query processing, such as pushing down predicates and minimizing communication are also important alongside ACQP and fit comfortably within its model.

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

We address a number of ACQP-related questions, including:

1. When should samples for a particular query be taken?
2. What sensor nodes have data relevant to a particular query?
3. In what order should samples for this query be taken, and how should sampling be interleaved with other operations?
4. Is it worth expending computational power or bandwidth to process and relay a particular sample?

Of these issues, question (1) is unique to ACQP. The remaining questions can be answered by adapting techniques that are similar to those found in traditional query processing. Notions of indexing and optimization, in particular, can be applied to answer questions (2) and (3), and question (4) bears some similarity to issues that arise in stream processing and approximate query answering. We will address each of

these questions, noting the unusual kinds of indices, optimizations, and approximations that are required in ACQP under the specific constraints posed by sensor networks.

Figure 1 illustrates the basic architecture that we follow throughout this paper - queries are submitted at a powered PC (the base station), parsed, optimized and sent into the sensor network, where they are disseminated and processed, with results flowing back up the routing tree that was formed as the queries propagated. After a brief introduction to sensor networks in Section 2, the remainder of the paper discusses each of these phases of ACQP: Section 3 covers our query language, Section 4 highlights optimization issues in power sensitive environments, Section 5 discusses query dissemination, and finally, Sections 6 discusses our adaptive, power-sensitive model for query execution and result collection.

See *Madden Ref.1* (section 1, Introduction)

TinyOS [7] is an event-based operating system for these devices that provides fine-grained interleaving of event processing and tasks from multiple system components. The complete TinyOS application for our study is shown in Figure 2. There is a component providing an synchronous interface to each sensor and a stack of components to implement networking over the radio. The lowest layer transmits or receives bytes bit-by-bit over the radio. It provides phase and rate controls to lock on to the packet start symbol and then to spool bits. At this level, the interface is half-duplex - the radio is receiving except during packet transmission. The packet-level component is responsible for spooling incoming bytes and delivering the packet receive event. It is where the media access control mechanisms for transmit reside. (It also performs the encoding and decoding of the byte stream onto the link and error checking: Manchester encoding with an 16-bit CRC.) Packets are short and of a fixed size, typically 30 bytes including an one byte destination field, an one byte handler field, and an application data unit. The Active Message component delivers tagged packet events to application level components. Here we have two such components. The sensor component periodically receives a clock event, acquires sensor data, and transmits the data toward a base station over the multihop network. The other component is responsible for building the dynamic multi-hop network and routing traffic. A simple beacon-based discovery protocol maintains a breadth-first spanning tree, such that each node knows a "parent node" closer to the base station. Originating sensor packets are marked for the parent. (All other nodes discard them.) At each hop, the multihop component receives a packet and retransmits it to the upstream level. In general, this component might perform aggregation or statistical analysis. However, we restrict ourselves to the case where it forwards all data to the infrastructure for analysis, as this focuses the work on the media access and transmission control aspects. This component does collect statistics on the number of nodes routing through it. The only buffering in the system is a fixed number of small packet buffers at the application level, one of

> which is used for the asynchronous receive. Thus, if the radio is busy transmitting or receiving when a packet send is requested, the request will fail back up to the application component. Once the packet component has accepted a packet for transmission, it will work on it until it acquires the channel and transmits it. Thus, the transmission rate control is implemented within the two application components.

See *Woo* (section 2.1, Networking Component Stack)

As can be seen from the foregoing, the Examiner-identified portions of Mulgund, Madden Ref.1 and Woo do *not recite or fairly suggest* the text of clause [a] as recited in Independent Claim 25. For example, Mulgund teaches "The process of visiting a node involves retrieving the information stored at the node, and updating the local database." Madden Ref.1 teaches "queries are submitted at a powered PC (the base station), parsed, optimized and sent into the sensor network, where they are disseminated and processed, with results flowing back up the routing tree that was formed as the queries propagated" (Madden Ref.1 section 1 Introduction). Woo Teaches "Originating sensor packets are marked for the parent. (All other nodes discard them.) At each hop, the multihop component receives a packet and retransmits it to the upstream level." (Woo, section 2.1) On the other hand, clause [a] recites "*means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, the first set of motes excluding the second mote*, and said means for transmitting being disposed proximate to said second mote.." (emphasis added). The cited text does not show or recite "*means for transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, the first set of motes excluding the second mote*."

Applicant has reviewed the Examiner-cited portions of Mulgund, Madden Ref.1 and Woo and is unable to locate a recitation of clause [a] of Claim 25. Applicant further respectfully points out that the Examiner has provided no objectively verifiable evidence, or argument based on objectively verifiable evidence, as to why the text of the reference passages should be interpreted to teach clause [a] of amended Independent Claim 25.

In addition, as noted above, after (1) interpreting the claim at issue and (2) defining one or more relevant prior art reference components, the Examiner should (3) ascertain the differences between the one or more prior art reference components and the

elements of the claim at issue, and (4) adduce objective evidence which establishes a teaching to modify the teachings of the prior art reference components such that the prior art reference components can be used to construct a device substantially equivalent to the claim at issue. (see pages 14-18 *infra*; *MPEP* § 2141; *MPEP* § 2143). Applicant respectfully submits Examiner's unpatentability analysis fails to adequately satisfy the Examiner's burden with respect to portions (3) and (4) of said analysis.

Given that Applicant has shown, above, what Mulgund, Madden Ref.1 and Woo actually recite, the question thus naturally arises as to how Examiner saw Mulgund, Madden Ref.1 and Woo as "teaching" something related to Clause [a] of Independent Claim 25. Applicant respectfully points out that the Applicant's Application is the only objectively verifiable examiner-cited document of record that shows or suggests what Examiner purports the reference to teach. From this and the express recitations of Mulgund, Madden Ref.1 and Woo as set forth, it follows that Examiner is interpreting Mulgund, Madden Ref.1 and Woo through the lens of Applicant's application, which is impermissible hindsight use. Thus, at present, Examiner's assertions regarding Mulgund, Madden Ref.1 and Woo are untenable. Under the MPEP guidelines as set forth above, the cited art of record fails to establish a prima facie case of unpatentability for at least these reasons. Accordingly, for at least the foregoing reasons, Applicant respectfully requests that Examiner hold Independent Claim 25 allowable and issue a Notice of Allowability of same.

In the alternative and/or in addition to the foregoing, as Examiner has provided no objectively verifiable evidence, nor argument based on objectively verifiable evidence, in support of Examiner assertions regarding what the technical material cited by Examiner "teaches," Applicant infers that the Examiner is relying on "personal knowledge" and/or is taking "official notice" of one or more factors to reach the factual conclusion of what the cited technical material "teaches." In view of the foregoing, if Examiner desires to maintain the rejection, in the next communication, Applicant respectfully requests that the Examiner provide an affidavit or declaration setting forth objectively verifiable evidence in support of Examiner's currently unsupported assertions regarding what the cited technical material "teaches" and/or should be interpreted to "teach." *See, e.g.*, MPEP §2144.03(C), *If Applicant Challenges a Factual Assertion as Not Properly*

Officially Notices or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding with Adequate Evidence, and 37 C.F.R. 1.104(d)(2).

In view of the foregoing, and under the MPEP standards as set forth above, Applicant respectfully submits that the Examiner-cited art does not establish a *prima facie* case of unpatentability of Independent Claim 25. Accordingly, for at least the foregoing reasons, Applicant respectfully asks Examiner to hold Independent Claim 25 allowable and to issue a Notice of Allowance of same.

E. Technical Material Cited by Examiner Mulgund et. al. ("U.S. Pub. No. 2002/0161751"), Madden et. al. ("TAG: a Tiny Aggregation Service for Ad-Hoc Sensor Networks") and Woo et. al. ("A Transmission Control Scheme for media Access in Sensor Networks") Do Not Show or Suggest the Text of Amended Independent Claim 26 as Presented Herein; Notice of Allowance of Same Respectfully Requested

1. Amended Independent Claim 26

Amended Independent Claim 26 recites:

> 26. A system comprising:
> at least one mote; and
> at least one multi-mote reporting entity resident in said at least one mote, *said at least one multi-mote reporting entity configured to report at least a part of a multi-mote content index stored in motes other than the at least one mote*. (emphasis added)

As shown in the following, the technical material cited by the Examiner does not show or suggest the text of Independent Claim 26. Accordingly, Applicant respectfully requests that Examiner allow Independent Claim 26.

a) Technical Material Cited by Examiner Does Not Show or Suggest the Text of at Least Amended Independent Claim 26.

As set forth above, Independent Claim 26 recites:

> 26. A system comprising:
> at least one mote; and
> [a] at least one multi-mote reporting entity resident in said at least one mote, *said at least one multi-mote reporting entity*

configured to report at least a part of a multi-mote content index stored in motes other than the at least one mote. (Emphases added)

With respect to Claim 26, Examiner has stated,

"As to claim 26, Mulgund shows a mote (Fig. 1 node (2)).

Mulgund does not explicitly show at least one multi-mote reporting entity resident in said at least one mote, said at least one multi-mote reporting entity configured to report at least a part of a multi-mote content index.

Madden shows at least one multi-mote reporting entity resident in said at least one mote, said at least one multi-mote reporting entity configured to report at least a part of a multi-mote content index [a TinyOS that facilitates routing data from child device to a parent device] (section 1 Introduction).

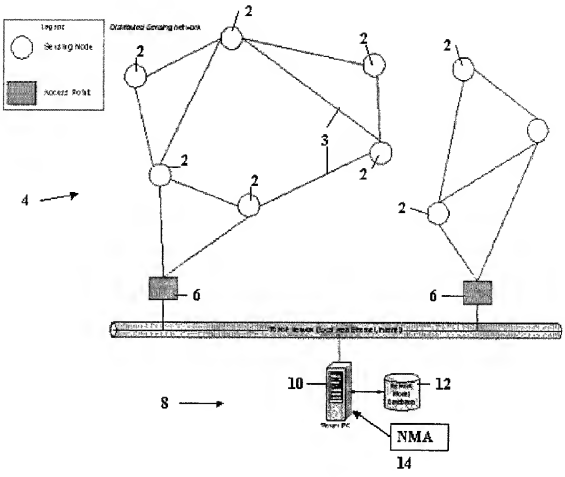
It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Mulgund by having at least one multi-mote reporting entity resident in said at least one mote, said at least one multi-mote reporting entity configured to report at least a part of a multi-mote content index in order to facilitate routing data between devices (Madden, section 1).

In support to the teaching of Madden, Woo shows a complete TinyOS application component graph wherein the sensor component periodically transmits the data toward a base station over the multihop network (section 2.1 Networking Component Stack)."

See Examiner's *Office Action*, p. 21-22 (May 27, 2008).

(1) Examiner Citations With Regard to Clause [a] of Independent Claim 26

Applicant respectfully points out that Applicant has reviewed the portions of Mulgund, Madden Ref.1 and Woo identified by Examiner, and so far as Applicant can discern, Mulgund, Madden Ref.1 and Woo do not recite the text of clause [a] of Applicant's Independent Claim 26. Rather, the portions of Mulgund, Madden Ref.1 and Woo cited by Examiner recites as follows:



See *Mulgund* (Fig. 1)

In the past few years, smart sensor devices have matured to the point that it is now feasible to deploy large, distributed networks of such sensors [42,23,37, 81. Sensor networks are differentiated from other wireless, battery-powered environments in that they consist of tens or hundreds of autonomous nodes that operate without human interaction (e.g. configuration of network routes, recharging of batteries, or tuning of parameters) for weeks or months at a time. Furthermore, sensor networks are often embedded into some (possibly remote) physical environment from which they must monitor and collect data. The long-term, low-power nature of sensor networks, coupled with their proximity to physical phenomena, lead to a significantly altered view of software systems than that of more traditional mobile or distributed environments. In this paper, we are concerned with query processing in sensor networks. Researchers have noted the benefits of a query processor-like interface to sensor networks and the need for sensitivity to limited power and computational resources [27,33,41,48,34]. Prior systems, however, tend to view query processing in sensor networks simply as a power-constrained version of traditional query processing: given some set of data, they strive to process that data as energy-efficiently as possible. Typical strategies include

minimizing expensive communication by applying aggregation and filtering operations inside the sensor network strategies that are familiar from push-down techniques from distributed query processing that emphasize moving queries to data.

In contrast, we present acquisitional query processing (ACQP), where we focus on the significant new query processing opportunity that arises in sensor networks: the fact that smart sensors have control over where, when, and how often data is physically acquired (i.e. sampled) and delivered to query processing operators. By focusing on the locations and costs of acquiring data, we are able to significantly reduce power consumption compared to traditional passive systems that assume the a priori existence of data. Acquisitional issues arise at all levels of query processing: in query optimization, due to the significant costs of sampling sensors; in query dissemination, due to the physical co-location of sampling and processing; and, most importantly, in query execution, where choices of when to sample and which samples to process are made. Of course, techniques proposed in other research on sensor and power-constrained query processing, such as pushing down predicates and minimizing communication are also important alongside ACQP and fit comfortably within its model.

We have designed and implemented an ACQP engine, called TinyDB (for more information on TinyDB, see [35]), which is a distributed query processor that runs on each of the nodes in a sensor network. TinyDB runs on the Berkeley Mica mote platform, on top of the TinyOS [23] operating system. We chose this platform because the hardware is readily available from commercial sources [13] and the operating system is relatively mature. TinyDB has many of the features of a traditional query processor (e.g. the ability to select, join, project, and aggregate data), but, as we will discuss in this paper, also incorporates a number of other features designed to minimize power consumption via acquisitional techniques. These techniques, taken in aggregate, can lead to orders of magnitude improvement in power consumption and increased accuracy of query results over non-acquisitional systems that do not actively control when and where data is collected.

We address a number of ACQP-related questions, including:

1. When should samples for a particular query be taken?
2. What sensor nodes have data relevant to a particular query?
3. In what order should samples for this query be taken, and how should sampling be interleaved with other operations?
4. Is it worth expending computational power or bandwidth to process and relay a particular sample?

Of these issues, question (1) is unique to ACQP. The remaining questions can be answered by adapting techniques that are similar to those found in traditional query processing. Notions of indexing and optimization, in particular, can be applied to answer questions (2) and (3), and question (4) bears some similarity to issues that arise in stream processing and approximate query answering. We will address each of

these questions, noting the unusual kinds of indices, optimizations, and approximations that are required in ACQP under the specific constraints posed by sensor networks.

Figure 1 illustrates the basic architecture that we follow throughout this paper - queries are submitted at a powered PC (the base station), parsed, optimized and sent into the sensor network, where they are disseminated and processed, with results flowing back up the routing tree that was formed as the queries propagated. After a brief introduction to sensor networks in Section 2, the remainder of the paper discusses each of these phases of ACQP: Section 3 covers our query language, Section 4 highlights optimization issues in power sensitive environments, Section 5 discusses query dissemination, and finally, Sections 6 discusses our adaptive, power-sensitive model for query execution and result collection.

See *Madden Ref.1* (section 1, Introduction)

TinyOS [7] is an event-based operating system for these devices that provides fine-grained interleaving of event processing and tasks from multiple system components. The complete TinyOS application for our study is shown in Figure 2. There is a component providing an synchronous interface to each sensor and a stack of components to implement networking over the radio. The lowest layer transmits or receives bytes bit-by-bit over the radio. It provides phase and rate controls to lock on to the packet start symbol and then to spool bits. At this level, the interface is half-duplex - the radio is receiving except during packet transmission. The packet-level component is responsible for spooling incoming bytes and delivering the packet receive event. It is where the media access control mechanisms for transmit reside. (It also performs the encoding and decoding of the byte stream onto the link and error checking: Manchester encoding with an 16-bit CRC.) Packets are short and of a fixed size, typically 30 bytes including an one byte destination field, an one byte handler field, and an application data unit. The Active Message component delivers tagged packet events to application level components. Here we have two such components. The sensor component periodically receives a clock event, acquires sensor data, and transmits the data toward a base station over the multihop network. The other component is responsible for building the dynamic multi-hop network and routing traffic. A simple beacon-based discovery protocol maintains a breadth-first spanning tree, such that each node knows a "parent node" closer to the base station. Originating sensor packets are marked for the parent. (All other nodes discard them.) At each hop, the multihop component receives a packet and retransmits it to the upstream level. In general, this component might perform aggregation or statistical analysis. However, we restrict ourselves to the case where it forwards all data to the infrastructure for analysis, as this focuses the work on the media access and transmission control aspects. This component does collect statistics on the number of nodes routing through it. The only buffering in the system is a fixed number of small packet buffers at the application level, one of

> which is used for the asynchronous receive. Thus, if the radio is busy transmitting or receiving when a packet send is requested, the request will fail back up to the application component. Once the packet component has accepted a packet for transmission, it will work on it until it acquires the channel and transmits it. Thus, the transmission rate control is implemented within the two application components.

See *Woo* (section 2.1, Networking Component Stack)

As can be seen from the foregoing, the Examiner-identified portions of Mulgund, Madden Ref.1 and Woo do *not recite or fairly suggest* the text of clause [a] as recited in Independent Claim 26. For example, Mulgund teaches "The process of visiting a node involves retrieving the information stored at the node, and updating the local database." Madden Ref.1 teaches "queries are submitted at a powered PC (the base station), parsed, optimized and sent into the sensor network, where they are disseminated and processed, with results flowing back up the routing tree that was formed as the queries propagated" (Madden Ref.1 section 1 Introduction). Woo Teaches "Originating sensor packets are marked for the parent. (All other nodes discard them.) At each hop, the multihop component receives a packet and retransmits it to the upstream level." (Woo, section 2.1) On the other hand, clause [a] recites "at least one multi-mote reporting entity resident in said at least one mote, *said at least one multi-mote reporting entity configured to report at least a part of a multi-mote content index stored in motes other than the at least one mote*." (emphasis added). The cited text does not show or recite "*said at least one multi-mote reporting entity configured to report at least a part of a multi-mote content index stored in motes other than the at least one mote*."

Applicant has reviewed the Examiner-cited portions of Mulgund, Madden Ref.1 and Woo and is unable to locate a recitation of clause [a] of Claim 26. Applicant further respectfully points out that the Examiner has provided no objectively verifiable evidence, or argument based on objectively verifiable evidence, as to why the text of the reference passages should be interpreted to teach clause [a] of amended Independent Claim 26.

In addition, as noted above, after (1) interpreting the claim at issue and (2) defining one or more relevant prior art reference components, the Examiner should (3) ascertain the differences between the one or more prior art reference components and the elements of the claim at issue, and (4) adduce objective evidence which establishes a teaching to modify the teachings of the prior art reference components such that the prior

art reference components can be used to construct a device substantially equivalent to the claim at issue. (see pages 14-18 *infra*; *MPEP* § 2141; *MPEP* § 2143). Applicant respectfully submits Examiner's unpatentability analysis fails to adequately satisfy the Examiner's burden with respect to portions (3) and (4) of said analysis.

Given that Applicant has shown, above, what Mulgund, Madden Ref.1 and Woo actually recite, the question thus naturally arises as to how Examiner saw Mulgund, Madden Ref.1 and Woo as "teaching" something related to Clause [a] of Independent Claim 26. Applicant respectfully points out that the Applicant's Application is the only objectively verifiable examiner-cited document of record that shows or suggests what Examiner purports the reference to teach. From this and the express recitations of Mulgund, Madden Ref.1 and Woo as set forth, it follows that Examiner is interpreting Mulgund, Madden Ref.1 and Woo through the lens of Applicant's application, which is impermissible hindsight use. Thus, at present, Examiner's assertions regarding Mulgund, Madden Ref.1 and Woo are untenable. Under the MPEP guidelines as set forth above, the cited art of record fails to establish a prima facie case of unpatentability for at least these reasons. Accordingly, for at least the foregoing reasons, Applicant respectfully requests that Examiner hold Independent Claim 26 allowable and issue a Notice of Allowability of same.

In the alternative and/or in addition to the foregoing, as Examiner has provided no objectively verifiable evidence, nor argument based on objectively verifiable evidence, in support of Examiner assertions regarding what the technical material cited by Examiner "teaches," Applicant infers that the Examiner is relying on "personal knowledge" and/or is taking "official notice" of one or more factors to reach the factual conclusion of what the cited technical material "teaches." In view of the foregoing, if Examiner desires to maintain the rejection, in the next communication, Applicant respectfully requests that the Examiner provide an affidavit or declaration setting forth objectively verifiable evidence in support of Examiner's currently unsupported assertions regarding what the cited technical material "teaches" and/or should be interpreted to "teach." *See, e.g.*, MPEP §2144.03(C), *If Applicant Challenges a Factual Assertion as Not Properly Officially Notices or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding with Adequate Evidence*, and 37 C.F.R. 1.104(d)(2).

In view of the foregoing, and under the MPEP standards as set forth above, Applicant respectfully submits that the Examiner-cited art does not establish a *prima facie* case of unpatentability of Independent Claim 26. Accordingly, for at least the foregoing reasons, Applicant respectfully asks Examiner to hold Independent Claim 26 allowable and to issue a Notice of Allowance of same.

2. Dependent Claims 27-29: Patentable for at Least Reasons of Dependency from Independent Claim 26.

Claims 27-29 depend either directly or indirectly from Independent Claim 26. "A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers." *See* 35 U.S.C. §112 paragraph 4. Consequently, Dependent Claims 27-29 are patentable for at least the reasons why Independent Claim 26 is patentable. Accordingly, Applicant respectfully requests that Examiner hold Dependent Claims 27-29 patentable for at least the foregoing reasons, and issue a Notice of Allowance on same.

IV. REJECTION ARGUMENT: THE OFFICE ACTION ERRED IN REJECTING CLAIMS 13-24 UNDER 35 U.S.C. § 112, FIRST PARAGRAPH

The Office action, at page 14-15, recites, "Claims 13-24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement." Applicant respectfully traverses the rejections of claims 13-24.

Amended Claim 13 recites:

13. A system comprising:

a transmitter controlled by a second mote to transmit at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes, wherein the first set of motes excludes the second mote.

The Office action at page 14-15, paragraph 12, recites: "As to claim 13, limitation: "means for transmitting" is interpreted to invoke 35 U.S.C. 112, sixth paragraph."

Applicant has amended claim 13 to include delete "means" recitations. Applicant submits that Claim 13 is not to be interpreted to invoke 35 U.S.C. 112, sixth paragraph and the rejection is moot. Therefore, application requests withdrawal of the rejection and reconsideration and allowance of claim 13.

Claims 14-24 are dependent on claim 13. For reasons analogous to those stated above, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 14-24.

V. REJECTION ARGUMENT: THE OFFICE ACTION ERRED IN REJECTING CLAIMS 25 AND 28 UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

The Examiner rejected claims 25 and 28 under 35 USC §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically the office action states "Claim 25 is ambiguous because it is unclear what is being meant by "proximate to a portion of said mote", which precludes the Examiner from adequately interpreting the words in the claim." Applicant has amended claim 25 by reciting "said means for transmitting being disposed proximate to said mote." Therefore, Applicant requests withdrawal of the rejections and reconsideration and allowance of claim 25

The office stated " As to claim 28, a multi-mote reporting entity is interpreted by the Examiner as a software program, in light of the specification at page 20, lines 5-9. It is unclear how a software program may comprise a processor, which is a hardware component." Applicant has amended claim 28 to remove "a processor" to clarify the alleged ambiguity.

Applicant respectfully requests reconsideration and withdrawal of this rejection and reconsideration and allowance of claims 25 and 28.

VI. OBJECTION TO THE CLAIMS

The Examiner objected to claims 4, 6, 10 and 11 because "As to claim 4, 6, and 10 (and 11) the claim language is unclear.". Examiner's *Office Action*, p. 12 (May 27,

2008). Applicant has amended claim to correct the informalities noted by the Examiner. Accordingly, Applicant respectfully requests reconsideration and withdrawal of these objections.

VII. OBJECTION TO THE ABSTRACT OF THE DISCLOSURE

The Examiner objected to the abstract because it does not enable the USPTO and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure. Examiner's *Office Action*, p. 11 (May 27, 2008). Applicant has amended the Abstract to correct the informalities noted by the Examiner. Accordingly, Applicant respectfully requests reconsideration and withdrawal of these objections.

VIII. OBJECTION TO THE APPLICATION

The Examiner objected to the application because it contains disclosure entirely outside the bounds of the claims. Examiner's *Office Action*, p. 11 (May 27, 2008). Applicant respectfully submits that the proper scope of the specification cannot be determined as the prosecution of the application is still pending. Applicant maintains that the scope of the disclosure is in compliance and requests that the office provide statutes, regulations or sections of the MPEP to support the offices objection. Accordingly, Applicant respectfully requests reconsideration and withdrawal of these objections.

IX. CLAIMS 13-24 RECITE STATUTORILY AUTHORIZED SUBJECT MATTER; NOTICE OF ALLOWANCE OF SAME RESPECTFULLY REQUESTED

A. Independent Claims 13-24 Recites Statutorily Authorized Subject Matter; 35 U.S.C. § 101 Non-statutory subject matter rejection is unfounded; Notice of Allowance of Same Respectfully Requested

Amended Independent Claim 13 recites as follows:

> 13. A system comprising:
> a transmitter controlled by a second mote to transmit at least a part of an aggregate of one or more mote-addressed content indexes of a first

set of motes, wherein the first set of motes excludes the second mote. (emphasis added)

With respect to Claim 13, the Examiner has stated:

"Claim 13-24 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 13 incorporates means-plus-function language limitations reciting a function to be performed rather than definite structure or materials for performing that function.

As to claim 13, limitations: "means for determining" and "means for creating" are interpreted to invoke 35 USC 112, sixth paragraph.

The current specification must be reviewed to assist in identifying the corresponding structure that performs the claimed function. The specification shows that transmitting at least a part of an aggregate of one or more mote-addressed content indexes of a first set of motes is performed by a multi-mote reporting entity (602) (page 20 paragraph 2 lines 5-9). Therefore, means for transmitting are interpreted to be a multi-mote reporting entity (602).

Since the multi-mote reporting entity is a computer program, as evidenced by specification at page 20, paragraph 2, lines 5-9, a system of a computer software per se is not in one of the statutory categories.

The use of the word "system" does not inherently mean that the claim is directed to a machine. Only if at least one of the claimed elements of the system is a physical part of a device can the system as claimed constitute part of a device or a combination of devices to be a machine within the meaning of 35 U.S.C. 101.

Evidence is present in the specification that suggests to one of ordinary skill in the art that all claimed elements of the system (means for aggregating) may be reasonably implemented as software programs per se, therefore the claim is rejected as a system of software per se, failing to fall within a statutory category of invention.

As to claims 14-24, additional means-plus-function language does not introduce any tangible elements by further limiting either one of means for determining or means for creating which were identified above as software elements per se. Therefore, additional means fail to render a system of claim 13 statutory under 35 U.S.C. 101."

See Examiner's *Office Action*, page 12-13 (May 27, 2008).

Applicant respectfully traverses the rejection. Claim 13 has been amended to no longer recite a means plus function claim rendering the office's rejection moot.

Further in response to Examiner, Applicant respectfully points out that the Federal Circuit has clearly stated, en banc, that computer programs that execute on processors have been found to be statutory subject matter on the grounds that the programs create a new computer. *In re* Alappat, 33 F.3d 1526, 31 USPQ2d 1545 (Fed.Cir. 1944) (en banc)

("We have held that such programming creates a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software."). More specifically, Independent claim 15, the claim at issue in *In re Alappat*, was interpreted to be "means plus function" claim within the ambit of 35 U.S.C. para. 6. In response to the PTO's argument that the claimed invention of *In re Alappat* covered a general purpose computer and was therefore not patentable subject matter, the Federal Circuit reversed the PTO and stated, ". . . a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software." The Federal Circuit further stated, ". . . a computer operating pursuant to software may represent patentable subject matter . . . ."

Applicants respectfully points out that Applicant's Application recites the following (other examples appear in Applicants Application) text:

> The foregoing detailed description has set forth various embodiments of the devices and/or processes via the use of block diagrams, flowcharts, and/or examples. Insofar as such block diagrams, flowcharts, and/or examples contain one or more functions and/or operations, it will be understood by those within the art that each function and/or operation within such block diagrams, flowcharts, or examples can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or virtually any combination thereof. In one embodiment, several portions of the subject matter described herein may be implemented via Application Specific Integrated Circuits (ASICs), Field Programmable Gate Arrays (FPGAs), digital signal processors (DSPs), or other integrated formats. However, those skilled in the art will recognize that some **aspects** of the embodiments disclosed herein, in whole or in part, can be equivalently **implemented in** integrated circuits, **as** one or more **computer programs running on one or more computers (e.g., as one or more programs running on one or more computer systems)**, **as** one or more **programs running on one or more processors (e.g., as one or more programs running on one or more microprocessors)**, as firmware, or as virtually any combination thereof, and that designing the circuitry and/or writing the code for the software and or firmware would be well within the skill of one of skill in the art in light of this disclosure. In addition, those skilled in the art will appreciate that the mechanisms of the subject matter described herein are capable of being distributed as a program product in a variety of forms, and that an illustrative embodiment of the subject matter described herein applies regardless of the particular type of signal bearing medium used to actually carry out the distribution. Examples of a signal bearing medium include, but are not limited to, the following: a recordable type medium such as a floppy disk, a hard disk

> drive, a Compact Disc (CD), a Digital Video Disk (DVD), a digital tape, a computer memory, etc.; and a transmission type medium such as a digital and/or an analog communication medium (e.g., a fiber optic cable, a waveguide, a wired communications link, a wireless communication link (e.g., transmitter, receiver, transmission logic, reception logic, etc.), etc.).
> . . .
> In a general sense, those skilled in the art will recognize that the various aspects described herein which can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, and/or any combination thereof can be viewed as being composed of various types of "electrical circuitry." Consequently, as used herein "electrical circuitry" includes, but is not limited to, electrical circuitry having at least one discrete electrical circuit, electrical circuitry having at least one integrated circuit, electrical circuitry having at least one application specific integrated circuit, **electrical circuitry forming a general purpose computing device configured by a computer program (e.g., a general purpose computer configured by a computer program which at least partially carries out processes and/or devices described herein**, or a **microprocessor configured by a computer program which at least partially carries out processes and/or devices described herein)**, electrical circuitry forming a memory device (e.g., forms of memory (e.g., random access, flash, read only, etc.)), and/or electrical circuitry forming a communications device (e.g., a modem, communications switch, optical-electrical equipment, etc.). Those having skill in the art will recognize that the subject matter described herein may be implemented in an analog or digital fashion or some combination thereof.

See Applicant's Application, at page 39 and page 40.

Applicant respectfully points out to Examiner that the underlined and highlighted portions of Applicant's Application substantially track the express language of *Alappat* as set forth above. Accordingly, Applicant respectfully submits that Applicant's Claim 17 constitutes patentable subject matter for at least this reason. In light of the foregoing, applicant respectfully requests withdrawal of the rejection and reconsideration and allowance of claim 13.

Claims 14-24 are dependent on claim 13. For reasons analogous to those stated above, applicant requests withdrawal of the rejections and reconsideration and allowance of claims 13-24.

X. CONCLUSION

Applicant may have during the course of prosecution cancelled and/or amended one or more claims. Applicant notes that any such cancellations and/or amendments will have transpired (i) prior to issuance and (ii) in the context of the rules that govern claim interpretation during prosecution before the United States Patent and Trademark Office (USPTO). Applicant notes that the rules that govern claim interpretation during prosecution form a radically different context than the rules that govern claim interpretation subsequent to a patent issuing. Accordingly, Applicant respectfully submits that any cancellations and/or amendments during the course of prosecution should be held to be tangential to and/or unrelated to patentability in the event that such cancellations and/or amendments are viewed in a post-issuance context under post-issuance claim interpretation rules.

Insofar as that the Applicant may have during the course of prosecution cancelled/amended/argued claims sufficient to obtain a Notice of Allowability of all claims pending, Applicant may not have during the course of prosecution explicitly addressed all rejections and/or statements in Examiner's Office Actions. The fact that rejections and/or statements may not be explicitly addressed during the course of prosecution should NOT be taken as an admission of any sort, and Applicant hereby reserves any and all rights to contest such rejections and/or statements at a later time. Specifically, no waiver (legal, factual, or otherwise), implicit or explicit, is hereby intended (e.g., with respect to any facts of which Examiner took Official Notice, and/or for which Examiner has supplied no objective showing, Applicant hereby contests those facts and requests express documentary proof of such facts at such time at which such facts may become relevant). For example, although not expressly set forth during the course of prosecution, Applicant continues to assert all points of (e.g. caused by, resulting from, responsive to, etc.) any previous Office Action, and no waiver (legal, factual, or otherwise), implicit or explicit, is hereby intended. Specifically, insofar as that Applicant does not consider the cancelled/unamended claims to be unpatentable, Applicant hereby gives notice that it may intend to file and/or has filed a continuing application in order prosecute such cancelled/unamended claims.

With respect to any cancelled claims, such cancelled claims were and continue to be a part of the original and/or present patent application(s). Applicant hereby reserves all rights to present any cancelled claim or claims for examination at a later time in this or another application. Applicant hereby gives public notice that any cancelled claims are still to be considered as present in all related patent application(s) (e.g. the original and/or present patent application) for all appropriate purposes (e.g., written description and/or enablement). Applicant does NOT intend to dedicate the subject matter of any cancelled claims to the public.

The Examiner is invited to contact Dale Barr (360) 627-7147 or Dale R. Cook at (425) 467-2260 with any issues that may advance prosecution of the application on the merits.

Respectfully submitted,

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